

CLAIMS

1. A hydraulic circuit for supplying fluid at a plurality of different pressures, the circuit comprising

5 (a) a reservoir containing fluid at an upstream pressure level;

(b) a pump for receiving a fluid from the reservoir and for raising a fluid pressure of the fluid from the upstream pressure level to a downstream pressure level;

10 (c) a pressure conduit for receiving the fluid from the pump;

(d) an adjustable relief valve for receiving fluid at the downstream pressure level from the pump, wherein the adjustable relief valve is

15 connected to a relief conduit and to the pressure conduit,

operable to open to connect the pressure conduit with the relief conduit when the downstream pressure level exceeds an actuation pressure level,

20 operable to close to isolate the pressure conduit from the relief conduit when the actuation pressure level exceeds or is equal to the downstream pressure level, and remotely adjustable to change the actuation pressure; and,

25 (e) remote control means for remotely adjusting the adjustable relief valve.

2. The hydraulic circuit as defined in claim 1 wherein the adjustable release valve comprises

30 a valve conduit for connecting the relief conduit to the pressure conduit to provide fluid communication therebetween;

a conduit blocking element for, when in a closed position, blocking the valve conduit to impede fluid communication between the pressure conduit and the relief conduit, and for, when in an open position, permitting fluid communication between the

pressure conduit and the relief conduit; and

5 a biasing means for biasing the conduit blocking element to the closed position when the downstream pressure level is less than the actuation pressure, wherein the biasing means is remotely adjustable by the remote control means to change the actuation pressure.

3. The hydraulic circuit as defined in claim 2 wherein the biasing means comprises a control surface;

10 the remote control means comprises

a pneumatic line for supplying pressurized air at a selected air pressure to the control surface,

15 an air pressure control means for controlling the selected air pressure of the air supplied to the control surface; and,

the remote control means is operable to controllably supply air pressure to the control surface to increase a biasing force of the biasing means to raise the actuation pressure of the adjustable relief valve.

20 4. The hydraulic circuit as defined in claim 3 wherein the hydraulic flow circuit is mounted on a vehicle, the remote control means being controllable from a cab of the vehicle.

25 5. The hydraulic circuit as defined in claim 4 further comprising a power takeoff means for drawing power from a vehicle transmission to power the pump.

30 6. The hydraulic circuit as defined in claim 5 wherein the remote control means comprises a safety valve for shutting off supply of air to the pneumatic line, the safety valve having an open position for permitting air flow into the pneumatic line and a closed position for blocking air flow into the pneumatic line, wherein the safety valve moves from the open position to the closed position when the power takeoff means is turned off, and

is manually switchable from the closed position to the open position when the power takeoff means is turned back on.

5       7. In a pump for providing a pressurized liquid to a hydraulic circuit, an adjustable relief valve, wherein the hydraulic circuit includes a pressure conduit for receiving pressurized liquid from the pump and a relief conduit for receiving pressurized liquid from the pump when the relief valve is open,  
10       the adjustable relief valve comprising

      a valve conduit for connecting the relief conduit to the pressure conduit to provide fluid communication therebetween;

      a conduit blocking element for, when the adjustable relief valve is in a closed position, blocking the valve conduit to impede fluid communication between the pressure conduit and the relief conduit, and for, when the adjustable relief valve is in an open position, permitting fluid communication between the pressure conduit and the relief conduit;

      a biasing means for biasing the conduit blocking element to the closed position when the downstream pressure level is less than the actuation pressure, wherein the biasing means is remotely adjustable to change the actuation pressure; and,

      remote control means for remotely adjusting the biasing means.

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8. The relief valve as defined in claim 7 wherein the biasing means comprises a control surface;  
      the remote control means comprises

      a pneumatic line for supplying pressurized air at a selected air pressure to the control surface,

      an air pressure control means for controlling the selected air pressure of the air supplied to the control surface; and,

      the remote control means is operable to controllably supply air pressure to the control surface to increase a biasing force

of the biasing means to raise the actuation pressure of the adjustable relief valve.

5 9. The relief valve as defined in claim 8 wherein the relief valve is mounted on a vehicle, the remote control means being controllable from a cab of the vehicle.

10 10. The relief valve as defined in claim 9 wherein the remote control means comprises a safety valve for shutting off supply of air to the pneumatic line, the safety valve having an open position for permitting air flow into the pneumatic line and a closed position for blocking air flow into the pneumatic line, wherein the safety valve moves from the open position to the closed position when the pump is turned off, and is manually switchable from the closed position to the open position after the pump is turned back on.

20 11. A method of modifying a hydraulic circuit to operate at multiple pressures, the hydraulic circuit having a reservoir containing fluid at an upstream pressure level; a pump for receiving a fluid from the reservoir and for raising a fluid pressure of the fluid from the upstream pressure level to a downstream pressure level; and

25 a pressure conduit for receiving the fluid from the pump; the method comprising the steps of incorporating into the hydraulic circuit

30 (a) an adjustable relief valve for receiving fluid at the downstream pressure level from the pump, wherein the adjustable relief valve is

- (i) connected to a relief conduit and to the pressure conduit,
- (ii) operable to open to connect the pressure conduit with the relief conduit when the downstream pressure level exceeds an actuation pressure level,

(iii) operable to close to isolate the pressure conduit from the relief conduit when the actuation pressure level exceeds or is equal to the downstream pressure level, and

5 (iv) remotely adjustable to change the actuation pressure; and,

(b) remote control means for remotely adjusting the adjustable relief valve.

10 12. The method as defined in claim 11 wherein the adjustable release valve comprises

a valve conduit for connecting the relief conduit to the pressure conduit to provide fluid communication therebetween;

a conduit blocking element for, when in a closed position,

15 blocking the valve conduit to impede fluid communication between the pressure conduit and the relief conduit, and for, when in an open position, permitting fluid communication between the pressure conduit and the relief conduit; and

20 a biasing means for biasing the conduit blocking element to the closed position when the downstream pressure level is less than the actuation pressure, wherein the biasing means is remotely adjustable by the remote control means to change the actuation pressure.

25 13. The method as defined in claim 12 wherein  
the biasing means comprises a control surface;  
the remote control means comprises  
a pneumatic line for supplying pressurized air at a  
selected air pressure to the control surface,  
30 an air pressure control means for controlling the  
selected air pressure of the air supplied to the control  
surface; and,  
the remote control means is operable to controllably supply  
air pressure to the control surface to increase a biasing force  
35 of the biasing means to raise the actuation pressure of the

adjustable relief valve.

14. The method as defined in claim 13 wherein the hydraulic flow circuit is mounted on a vehicle, the remote control means being  
5 controllable from a cab of the vehicle.

15. The method as defined in claim 14 further comprising a power takeoff means for drawing power from a vehicle transmission to power the pump.

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16. The method as defined in claim 15 wherein the remote control means comprises a safety valve for shutting off supply of air to the pneumatic line when the power takeoff means is off, and for shutting off supply of air to the pneumatic line when the power  
15 takeoff means is turned back on after being off, the safety valve having an open position for permitting air flow into the pneumatic line and a off position for blocking air flow into the pneumatic line, wherein the safety valve moves from the open position to the closed position when the power takeoff means is turned off, and is manually switchable from the off position to the on position after the power takeoff means is turned back on.  
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